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# More Accurate Racial and Ethnic Codes for Medicare Administrative Data

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*Analyses of health care disparities in Medicare using administrative race and ethnicity data have typically been limited to Black and White beneficiaries. This is in part due to the small size of the other categories, inaccuracies in the race and ethnicity codes, and caveats that more extensive analyses would produce biased results. While previous Medicare efforts certainly improved the accuracy of race and ethnicity coding, we have developed an imputation algorithm that dramatically improves the accuracy of coding for Hispanic and Asian or Pacific Islander beneficiaries. When compared with self-reported race and ethnicity, sensitivity increased from 29.5 to 76.6 percent for Hispanic and from 54.7 to 79.2 percent for Asian and Pacific Islander beneficiaries, with no loss of specificity, and Kappa coefficients reaching 0.80. As a result, 2,245,792 beneficiaries were recoded to Hispanic and 336,363 to Asian or Pacific Islander.*

## INTRODUCTION

Medicare administrative data should be an ideal resource to examine the extent of racial and ethnic disparities in the program. However, small population size and recognized inaccuracies in the coding of race/ethnicity in the Medicare enrollment database (EDB) have led health policy analysts to be wary of making comparisons that go beyond White and Black beneficiaries.

Some have advised against the analysis of data for Hispanic, Asian/Pacific Islander, and American Indian/Alaska Native beneficiaries because of potential bias in analyses when large proportions of these relatively small racial/ethnic groups are not correctly identified, and they differ in important ways from those who are (Lauderdale and Goldberg, 1996; Arday et al., 2000).

Historically, the Medicare Program has received its race/ethnicity code for beneficiaries from the Social Security Administration's (SSA's) master beneficiary record (MBR). From 1935 to 1980, the Social Security application form (SS-5) incorporated into the MBR only allowed classification of an applicant's race into White, Black, or Other. "Unknown" was used to classify persons who did not report any race. In 1980, the number of race/ethnicity categories on the form was expanded to six responding to Office of Management and Budget (OMB) Directive 15: (1) White (non-Hispanic); (2) Black (non-Hispanic); (3) Hispanic; (4) Asian, Asian American, or Pacific Islander; (5) American Indian or Alaska Native; and (6) Unknown. In 1989, SSA began to enroll new participants at birth, extracting data from birth certificates rather than requiring applicants to file Form SS-5; however, the race/ethnicity information on the birth certificate was not included in the data extraction because it was considered unnecessary for administration of the SSA program. Since 1989, the only persons filing an SS-5 form have been those requesting a new number or a name change (Scott, 1999).

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The authors are with RTI International. The research in this article was supported by the Centers for Medicare & Medicaid Services (CMS) under Contract Number 500-00-0024 (TO8). The statements expressed in this article are those of the authors and do not necessarily reflect the views or policies of RTI International, or CMS.

In 1994, race data from the SS-5 forms with the expanded race/ethnicity codes were integrated into the EDB directly to correct erroneous and missing codes. This changed the race/ethnicity coding for more than 2.5 million beneficiaries (Lauderdale and Goldberg, 1996). This update using the SS-5 form was repeated in 1997 and 2000, and is now conducted annually. The Medicare Program has also worked with the Indian Health Service to improve the coding of American Indians/Alaska Natives.

In 1997, to correct miscoded data and reduce the amount of missing race/ethnicity information, the Health Care Financing Administration (now CMS) conducted a postcard survey of nearly 2.2 million beneficiaries. The survey included beneficiaries with Hispanic surnames or Hispanic countries of birth and beneficiaries coded as “Other” or “Missing” race/ethnicity data. The survey resulted in changes for approximately 858,000 beneficiaries (Arday et al., 2000). These efforts clearly improved the EDB’s race/ethnicity data. Nonetheless, comparisons of the EDB race/ethnicity codes with self-reported race/ethnicity data from the Medicare Current Beneficiary Survey (MCBS) indicated that identification of Hispanics, Asians/Pacific Islanders, and American Indians/Alaska Natives was still quite incomplete and might result in biased analyses (Arday et al., 2000). An analysis comparing the distribution of race/ethnicity for Medicare beneficiaries age 65 or over in the EDB to that of U.S. Census estimates of similar aged persons produced similar results (Eggers and Greenberg, 2000). A recent analysis comparing EDB to MCBS race/ethnicity codes continues to find large proportions of these same groups to be misclassified in the EDB (Waldo, 2004-2005).

## METHODS

This work was conducted to identify health care disparities among Medicare beneficiaries, including Hispanics and Asians/Pacific Islanders. We first assessed the accuracy of the race/ethnicity coding on the EDB, then developed and validated an imputation algorithm to improve the accuracy of the EDB race/ethnicity code, applying it to the EDB.

### Data

We conducted multiple analyses in the process of assessing and improving the race/ethnicity coding on the EDB. The data we used included:

- Separate Hispanic/Latino and Asian/Pacific Islander surname lists from the 1990 and 2000 U.S. Census.
- Separate Hispanic/Latino and Asian/Pacific Islander first-name lists compiled from multiple Web sites.
- Self-reported race/ethnicity of 830,728 Medicare beneficiary respondents from three different Consumer Assessment of Health Care Providers Survey (CAHPS®) conducted from 2000 to 2002, including: Medicare fee-for-service, Medicare managed care enrollee, and Medicare managed care disenrollee. We henceforth refer to these as the CAHPS® data. The self-reported race/ethnicity codes from these data are the SELFRACE variable and constitute the gold standard.
- Several variables found on the Medicare EDB, including: Race/ethnicity<sup>1</sup>, henceforth referred to as EDBRACE, has eight values and allows beneficiaries only one value each. The eight values are: (1) 0 = Unknown, (2) 1 = White (non-Hispanic), (3) 2 = Black (non-Hispanic), (4) 3 =

<sup>1</sup> The definitions of the values we have listed for EDBRACE are what we believe to have been intended by the codes.

Other, (5) 4 = Asian/Pacific Islander, (6) 5 = Hispanic/Latino, (7) 6 = American Indian/Alaska Native, and (8) Blank = Temporary record.

- Other variables that identified language, source of beneficiaries' race/ethnicity code, and State from the beneficiary's mailing address.

## Variable Creation

Prior to making comparisons, we created a self-reported race variable, SELFRACE, from the following two CAHPS® questions on race and ethnicity:

- Are you of Hispanic or Latino origin or descent?
  - Yes, Hispanic or Latino
  - No, not Hispanic or Latino
- What is your race?<sup>2</sup> Please mark one or more.
  - White
  - Black or African-American
  - Asian
  - Native Hawaiian or other Pacific Islander
  - American Indian or Alaska Native

To make meaningful comparisons, SELFRACE was created with similar logic and the same codes as EDBRACE. We did the following to make SELFRACE comparable with EDBRACE:

- If a CAHPS® respondent reported being Hispanic/Latino, SELFRACE was set to Hispanic/Latino.
- Otherwise, if a CAHPS® respondent reported not being Hispanic/Latino (or the response was missing) and only chose one race, SELFRACE was set to the value of the race chosen. For example, if a respondent chose Asian or Native Hawaiian or other Pacific Islander, SELFRACE was set to Asian/Pacific Islander.

- If a CAHPS® respondent reported not being Hispanic/Latino (or the response was missing) and reported more than one race, SELFRACE was set to two or more.<sup>3</sup>
- If a respondent's answer was missing for both questions, SELFRACE was set to unknown.
- If the respondent reported not being Hispanic/Latino (or the answer was missing), and did not indicate a race, SELFRACE was set to unknown.

We then compared SELFRACE with EDBRACE for all of the CAHPS® respondents.

## Statistical Methods

Using SELFRACE, we assessed EDBRACE using accuracy and agreement statistics (i.e., sensitivity, specificity, positive predictive value, negative predictive value, and the Kappa coefficient). Table 1 shows the association between EDBRACE and SELFRACE by measuring true positive (a)—EDBRACE and SELFRACE agree on the beneficiary's race/ethnicity, false negative (b)—EDBRACE disagrees with SELFRACE on what the beneficiary's race/ethnicity is not, false positive (c)—EDBRACE disagrees with SELFRACE on what the beneficiary's race/ethnicity is, and true negative (d)—EDBRACE and SELFRACE agree on what the beneficiary's race/ethnicity is not.

Sensitivity represents how successful EDBRACE was at correctly identifying a beneficiary's race/ethnicity and is calculated as  $(a / [a + b]) \times 100$ . Specificity indicates how often the EDBRACE variable correctly identified persons who are not in a given racial/ethnic group and is calculated as  $(d / [c + d]) \times 100$ . Positive predictive value is calculated as  $(a / [a +$

<sup>2</sup> In 2000, CAHPS® included an option for beneficiaries to select "Other" as a race.

<sup>3</sup> Since the EDB did not have an equivalent category, we did not include the small number of beneficiaries coded this way in our analyses.

c])  $\times 100$ . Negative predictive value is calculated as  $(d / [b + d]) \times 100$ . (All calculations are derived from Table 1.)

Although the goal is for both sensitivity and specificity to be high, there is a tradeoff between them. A similar relationship exists between positive and negative predictive values. The goal is for both to be high, but when we seek to improve one it is often at the expense of the other. We set a target of increasing sensitivity to 75 percent, with negligible impact on specificity.

Finally, we calculated the Kappa coefficient (Cohen, 1960), widely used as a measure of inter-rater reliability, the Kappa coefficient ranges from 1 (complete agreement), through 0 (no agreement), to -1 (complete disagreement). We set a goal of achieving a Kappa coefficient of at least 0.81. Landis and Koch (1977) suggested the following interpretations for the Kappa coefficient:

Kappa Statistic	Strength of Agreement
<0.00	Poor
0.00–0.20	Slight
0.21–0.40	Fair
0.41–0.60	Moderate
0.61–0.80	Substantial
0.81–1.00	Almost Perfect

## RESULTS

### Assessing the EDB

Table 2 illustrates the agreement between SELFRACE and EDBRACE, with respect to the classification of beneficiaries as White or non-White and repeats the same analysis for Black, Hispanic, Asian/Pacific Islander, and American Indian/Alaska Native beneficiaries.

The table reveals some low levels of accuracy and agreement between EDBRACE and SELFRACE in correctly identifying Hispanic, Asian/Pacific Islander, and American Indian/Alaska Native Medicare beneficiaries. For example, there are 43,927 self-reported Hispanics in the CAHPS® data, but the EDB has correctly classified only 12,953. In other words, as reflected by the sensitivity statistic, the EDB captures only 29.5 percent of Hispanic beneficiaries. There is somewhat better agreement for Asians/Pacific Islanders, with a sensitivity of 54.7 percent. But only 35.7 percent of American Indians/Alaska Natives are identified in the EDB. The sensitivity of the EDB for correctly identifying Black and White beneficiaries is excellent.

The EDB also does an excellent job of not misclassifying non-Hispanic, non-Asian/Pacific Islander, non-Black, and non-American Indian/Alaska Native beneficiaries. This is shown by the specificities reaching 98.8 percent or higher for these groups.

**Table 1**  
**Race/Ethnicity Agreement for a Given Beneficiary and Group According to Placement, by CAHPS® and EDB**

Where CAHPS® <sup>1</sup> Race/Ethnicity Measures Puts the Beneficiary	Where the EDB <sup>2</sup> Race/Ethnicity Measures Puts the Beneficiary	
	In the Group	Not in the Group
In the Group	a True Positive	b False Negative
Not in the Group	c False Positive	d True Negative

<sup>1</sup> CAHPS® (SELFRACE) is considered the gold standard.

<sup>2</sup> EDB (EDBRACE) is considered the test measure.

NOTES: CAHPS® is Consumer Assessment of Health Plans Study. EDB is Medicare enrollment database.

SOURCE: Eicheldinger, C. and Bonito, A., RTI International, 2007.



**Table 2**  
**Accuracy and Agreement Between SELFRACE and EDBRACE**

Accuracy and Agreement Measures for EDBRACE								
Reference Group	SELFRACE Assignment	EDBRACE Assignment		Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value	Kappa
		Yes	No					
Percent								
White	Yes	667,573	4,420	99.3	61.7	91.7	95.7	0.71
	No	60,794	97,941					
Black	Yes	57,867	1,515	97.4	98.8	86.3	99.8	0.91
	No	9,209	762,137					
Hispanic	Yes	12,953	30,974	29.5	99.9	92.7	96.2	0.43
	No	1,025	785,776					
Asian/Pacific Islander	Yes	8,008	6,626	54.7	99.8	84.5	99.2	0.66
	No	1,469	814,625					
American Indian/ Alaska Native	Yes	1,194	2,150	35.7	99.9	59.9	99.7	0.45
	No	799	826,585					
Other/Unknown	Yes	478	27,158	1.7	98.8	4.9	96.7	0.01
	No	9,357	793,735					

NOTES: EDBRACE is the unadjusted variable from the mid-July 2003 Medicare EDB for beneficiaries responding to the CAPHS® fee-for-service, managed care enrollee, and disenrollee surveys for 2000-2002. SELFRACE is the variable for respondents from the CAHPS® fee-for-service, managed care enrollee, and disenrollee surveys for 2000-2002.

SOURCE: Eicheldinger, C. and Bonito, A., RTI International, 2007.

However, the specificity is considerably lower for White beneficiaries, only 61.7 percent indicating 60,794 of the 158,735 non-White beneficiaries are mistakenly identified as White in the EDB. This supports the suggestion that many beneficiaries classified as White in the EDB actually belong in another category.

The overall level of agreement, reflected in the Kappa coefficients, is only moderate for Hispanics, Asians/Pacific Islanders, and American Indians/Alaska Natives—0.43, 0.66, and 0.45, respectively. We speculate that many Hispanic, Asian/Pacific Islander, and American Indian/Alaska Native beneficiaries were coded as White because the appropriate categories were unavailable until relatively recently. While the Kappa for White beneficiaries is substantial (0.71), it is not as high as we would like, undoubtedly reflecting their rather low specificity.

## Improving the Coding on the EDB

In light of the low sensitivity for Hispanics and Asians/Pacific Islanders in the

EDB, we developed separate Hispanic and Asian/Pacific Islander imputation algorithms. These algorithms used the following pieces of EDB information:

- LANGPREF or the language a beneficiary prefers CMS use when sending the *Medicare Handbook*. Allowed values are English, Spanish, and blank (no preference specified).
- LANGCD or the language a beneficiary has requested SSA use when sending beneficiary notices. This variable is used by CMS for Medicare premium bills. English, Spanish, and blank are the allowed values.
- RACESRC or the source of a beneficiary's EDB race/ethnicity code. Three values are allowed:  
 A = Response from a one-time survey that was mailed to 2.2 million in 1997.  
 B = Data from the Indian Health Service.  
 Blank = Data from the SSA's—Master Beneficiary Record (SSA-MBR), SS-5 form (NUMIDENT), or Railroad Retirement Board (RRB).

- The State in which a beneficiary resides so we could identify beneficiaries living in Hawaii and Puerto Rico.

At the core of the algorithm were Hispanic (Word and Perkins, 1996) and Asian/Pacific Islander (Falkenstein and Word, 2002) surname lists developed at the U.S. Census Bureau. Associated with each name on the list was the proportion of times a household headed by a person with a particular surname was indeed a Hispanic (or Asian/Pacific Islander) household, as reported to the U.S. Census. In addition to the surname lists we also included in the algorithm a list of common Hispanic and Asian/Pacific Islander first names.

We incorporated these pieces of information into a SAS<sup>®</sup> program that, through an iterative process, created two new variables for every beneficiary. The first, NEWHISPANIC, identified each beneficiary as Hispanic or not. The second, NEWAPI, identified each beneficiary as Asian/Pacific Islander or not. The logic of the algorithm used to create NEWHISPANIC follows as well as a description of how NEWAPI was created and how the two were combined to create NEWRACE.

NEWHISPANIC was turned on if any of the following criteria were met:

- The beneficiary's surname matched the Hispanic surname list and the assigned percentage from the list was at least 70 percent.
- The EDB coded the beneficiary as Hispanic.
- The person was living in Puerto Rico.
- The variable LANGCD indicated Spanish.
- The beneficiary's first name had Hispanic origins, and the beneficiary's surname matched the Hispanic surname list with the assigned percentage of at least 50 percent.

NEWHISPANIC was turned off if any of the following criteria were met<sup>4</sup>:

- The beneficiary was not identified as Hispanic in the previously mentioned steps.
- LANGPREF indicated English.
- RACESRC indicated the race code came from the 1995 survey, and that race code was not Hispanic.
- RACESRC indicated the beneficiary's race code came from the Indian Health Service.

Similar logic was used to set the value of NEWAPI with the exception that the EDB variables LANGCD and LANGPREF were not used because they did not contain an Asian/Pacific Islander language indicator.

Using the self-reported race/ethnicity data from the CAHPS<sup>®</sup> survey as the gold standard, we assessed the results of applying the algorithm to create the NEWHISPANIC and NEWAPI variables for the CAHPS<sup>®</sup> respondents. We found the algorithms significantly improved the EDB race/ethnicity categorization of Hispanic and Asian/Pacific Islander beneficiaries. Among Hispanic beneficiaries, sensitivity improved from 29.5 to 76.6 percent, the Kappa coefficient rose from 0.43 to 0.79, and the other measures (specificity and predictive values) remained virtually unchanged. The amount of improvement for Asian/Pacific Islander beneficiaries was not as dramatic but still impressive—sensitivity rose from 54.7 to 79.2 percent, Kappa increased from 0.66 to 0.80, and the other measures were not materially changed. Analysis of the improvements indicated that among both groups there were somewhat more males correctly identified than females (possibly because of intermarriage and surname changes for ethnic females), and more 65 to 74 year

<sup>4</sup> The last three criteria listed for identifying whether a beneficiary was non-Hispanic had the effect of changing some beneficiaries identified by the first half of the algorithm as Hispanic back to non-Hispanic.

Table 3

**Comparison of EDBRACE, NEWRACE, and SELFRACE (CAHPS®) Distributions of Race/Ethnicity**

Race/Ethnicity	Persons for					
	EDBRACE		NEWRACE		SELFSPACE	
	Number	Percent	Number	Percent	Number	Percent
White	728,367	87.7	704,185	84.8	671,993	80.9
Black	67,076	8.1	66,328	8.0	59,382	7.2
Hispanic	13,978	1.7	39,862	4.8	43,927	5.9
Asian/Pacific Islander	9,477	1.1	13,812	1.7	14,634	1.8
American Indian/Alaska Native	1,993	0.2	1,977	0.2	3,344	0.4
Other/Unknown	9,835	1.2	4,563	0.6	27,636	3.3

NOTES: EDBRACE is the unadjusted variable from the mid-July 2003 Medicare EDB for beneficiaries responding to the CAHPS® fee-for-service, managed care enrollee, and disenrollee surveys for 2000-2002. SELFRACE is the variable for respondents from the CAHPS® fee-for-service, managed care enrollee, and disenrollee surveys for 2000-2002. NEWRACE is the result of applying the race/ethnicity recoding algorithm to the Medicare EDB variable from mid-July 2003.

SOURCE: Eicheldinger, C. and Bonito, A., RTI International, 2007.

olds were correctly identified than those age 74 or over (probably because there are more beneficiaries in the younger age group).

Before merging the NEWHISPANIC and NEWAPI variables together we used the CAHPS® survey data to investigate the extent of possible overlap. We examined whether the same beneficiary was considered Hispanic by one algorithm and Asian/Pacific Islander by the other. Out of 830,728 beneficiaries, only 433 (0.05 percent) were labeled both Hispanic and Asian/Pacific Islander<sup>5</sup>. Because the overlap involved barely five-one-hundredths of 1 percent of CAHPS® respondents, we decided that it was not large enough to cause great concern when combining the two algorithms. The logic of combining the two surname algorithms used to create NEWRACE follows:

- If the Hispanic algorithm identified the beneficiary as Hispanic, then the NEWRACE variable was set to Hispanic.
- Otherwise<sup>6</sup>, if the Asian/Pacific Islander surname algorithm identified the beneficiary as Asian/Pacific Islander, then the

NEWRACE variable was set to Asian/Pacific Islander.

- Otherwise, NEWRACE was set equal to the race/ethnicity coding of the original EDB race/ethnicity variable, EDBRACE.

Table 3 presents a comparison of the distribution of the three race/ethnicity variables—EDBRACE, SELFRACE, and NEWRACE—reported for the combined 2000-2002 pool of CAHPS® respondents. As expected, the numbers for NEWRACE are much closer to the self-reported gold standard of SELFRACE than for EDBRACE for Hispanics and Asians/Pacific Islanders. For White, the NEWRACE numbers also are closer to the SELFRACE numbers, probably because the EDB mislabeled a large proportion of Hispanic beneficiaries as White. As expected, the distribution of American Indians/Alaska Natives and Black beneficiaries changed little from one race/ethnicity variable to another because no direct effort was made to alter how they were coded.

Table 4 presents more detail on how the NEWRACE variable compares to EDBRACE and SELFRACE by sex and age group for Hispanics and Asians/Pacific Islanders. The EDBRACE/SELFSPACE ratio shows that the EDB only represents a relatively small proportion of both males and females of all ages correctly for Hispanics (29.5 percent) and Asians/

<sup>5</sup> The overlap is due to surnames (likely Filipino) appearing on both the Hispanic and Asian/Pacific Islander surname lists. No overlap occurred on the first name lists.

<sup>6</sup> If a beneficiary was identified as Hispanic and Asian or Pacific Islander, the beneficiary was considered Hispanic.

Pacific Islanders (54.7 percent). The ratio of NEWRACE to EDBRACE shows that there are many more identified Hispanics (260 percent) and Asians/Pacific Islanders (141.4 percent). The final ratio, NEWRACE/SELRACE shows that across the board, NEWRACE represents a much higher proportion of SELFRACE than EDBRACE does for both Hispanics (76.7 percent) and Asians/Pacific Islanders (77.4 percent). While the ratios vary slightly, the same pattern is true for both sexes and all age groups of both racial/ethnic groups.

## Applying the Results to the Full EDB

We combined the algorithms and proceeded to update race/ethnicity for the entire EDB. CMS provided records for all 43.1 million active Medicare beneficiaries in the 10 segments of the October 2005 unloaded EDB, and we processed them through the combined naming algorithm. A total of 2,582,155 beneficiaries received a new race/ethnicity code. Table 5 shows the distribution of race/ethnicity on the full EDB before and after applying the combined naming algorithm. Non-Hispanic White beneficiaries dropped from 83.5

**Table 4**  
**Comparison of EDBRACE, NEWRACE, and SELFRACE (CAHPS®) Distributions of Race/Ethnicity, by Demographic Characteristics**

Demographic Characteristic	Number of Persons			Ratios		
	EDBRACE <sup>1</sup>	NEWRACE <sup>2</sup>	SELRACE (CAHPS®) <sup>3</sup>	EDBRACE/ SELFRACE	NEWRACE/ EDBRACE	NEWRACE/ SELFRACE
Hispanic	12,953	33,679	43,927	0.295	2.6	0.767
Male	6,167	16,118	19,857	0.311	2.614	0.812
Under 65 Years	967	2,214	2,668	0.362	2.29	0.83
65 Years or Over	5,200	13,904	17,189	0.303	2.674	0.809
65-74 Years	1,924	7,689	9,354	0.206	3.996	0.822
75-84 Years	2,849	5,257	6,493	0.439	1.845	0.81
85 Years or Over	427	958	1,342	0.318	2.244	0.714
Female	6,786	17,561	24,070	0.282	2.588	0.73
Under 65 Years	710	1,667	2,210	0.321	2.348	0.754
65 Years or Over	6,076	15,894	21,860	0.278	2.616	0.727
65-74 Years	2,115	8,284	11,294	0.187	3.917	0.733
75-84 Years	3,315	6,113	8,331	0.398	1.844	0.734
85 Years or Over	646	1,497	2,235	0.289	2.317	0.67
Asian/Pacific Islander	8,008	11,325	14,634	0.547	1.414	0.774
Male	3,692	5,251	6,501	0.568	1.422	0.808
Under 65 Years	132	177	280	0.471	1.341	0.632
65 Years or Over	3,560	5,074	6,221	0.572	1.425	0.816
65-74 Years	1,356	2,306	3,021	0.449	1.701	0.763
75-84 Years	1,775	2,200	2,544	0.698	1.239	0.865
85 Years or Over	429	568	656	0.654	1.324	0.866
Female	4,316	6,074	8,133	0.531	1.407	0.747
Under 65 Years	135	161	257	0.525	1.193	0.626
65 Years or Over	4,181	5,913	7,876	0.531	1.414	0.751
65-74 Years	1,692	2,689	3,937	0.43	1.589	0.683
75-84 Years	2,001	2,531	3,127	0.64	1.265	0.809
85 Years or Over	488	693	812	0.601	1.42	0.853

<sup>1</sup> Includes only the individuals whose EDBRACE matched their SELFRACE.

<sup>2</sup> Includes only the individuals whose NEWRACE matched their SELFRACE.

<sup>3</sup> Distribution represents original SELFRACE distribution from CAHPS®.

NOTES: EDBRACE is the unadjusted variable from the mid-July 2003 Medicare EDB for beneficiaries responding to the CAHPS® fee-for-service, managed care enrollee, and disenrollee surveys for 2000-2002. SELFRACE is the variable for respondents from the CAHPS® fee-for-service, managed care enrollee, and disenrollee surveys for 2000-2002. NEWRACE is the result of applying the race/ethnicity recoding algorithm to the Medicare EDB variable from mid-July 2003.

SOURCE: Eicheldinger, C. and Bonito, A., RTI International, 2007.



Table 5

**Comparison of the Distribution of Race/Ethnicity According to EDBRACE and NEWRACE for the Entire October 2005 Unloaded Medicare Enrollment Database (EDB)**

Race/Ethnicity	Original EDB Race Variable (EDBRACE)		New EDB Race Variable (NEWRACE)	
	Frequency	Percent	Frequency	Percent
White	35,994,152	83.5	34,088,099	79.1
Black	4,233,394	9.8	4,143,584	9.6
Hispanic	946,731	2.2	3,192,523	7.4
Asian/Pacific Islander	656,408	1.5	956,513	2.2
American Indian/Alaska Native	169,557	0.4	167,852	0.4
Other	980,040	2.3	455,328	1.1
Unknown	130,608	0.3	107,209	0.2
Missing	1,135	0	917	0
Total	43,112,025	100	43,112,025	100

NOTES: EDBRACE is the unadjusted variable from the EDB from October 2005. NEWRACE is the result of the author's tabulations of having run the algorithm on those same beneficiaries from the EDB from October 2005.

SOURCE: Eicheldinger, C. and Bonito, A., RTI International, 2007.

to 79.1 percent, and beneficiaries coded Other dropped from 2.3 to 1.1 percent. Conversely, Hispanics increased from 2.2 to 7.4 percent, and Asians/Pacific Islanders increased from 1.5 to 2.2 percent.

Table 6 shows that as a result of the combined naming algorithm, 2,245,792 beneficiaries had their race/ethnicity recoded to Hispanic, while 336,363 beneficiaries were recoded to Asian/Pacific Islander. Most of the beneficiaries recoded to Hispanic were originally classified as White (82.5 percent), followed by Other (11.2 percent) and Black (3.8 percent). Few beneficiaries recoded to Hispanic were originally coded as Asian/Pacific Islander (1.6 percent) or American Indian/Alaska Native (less than 0.05 percent). Unlike Hispanics whose race/ethnicity was most often originally coded White on the EDB, the majority of the new Asians/Pacific Islanders were originally coded Other. Exactly 80.9 percent of the newly coded Asians/Pacific Islanders were originally coded Other. In comparison, 15.7 percent were originally coded as White, 1.4 percent as Black, and 0.2 percent as American Indian/Alaska Native. Note that no beneficiaries originally coded Hispanic were recoded to Asian/Pacific Islander.

The percentages of males recoded to either Hispanic (46.5 percent) or Asian/Pacific Islander (47.0 percent) were slightly higher than the percentage of males on the EDB (44.0 percent). More beneficiaries under age 75 were recoded to Hispanic (73.6 percent) or Asian/Pacific Islander (73.2 percent) than would be expected based on the distribution of all beneficiaries under age 75 (59.2 percent). Larger percentages of beneficiaries recoded to Hispanic (23.4 percent) and Asian/Pacific Islander (23.2 percent) were enrolled in Medicare Advantage than on the full EDB (14.3 percent). Higher percentages of beneficiaries recoded to Hispanic (24.7 percent), and Asian or Pacific Islander (22.0 percent) were also dually eligible than on the full EDB (15.5 percent), likely reflecting the minorities' lower socioeconomic status.

While 23.1 percent of Medicare beneficiaries live outside of a metropolitan statistical area (MSA), only 6.4 percent of the recoded Asians/Pacific Islanders do. However, 33.3 percent of recoded Hispanics reside outside of an MSA. With respect to geographic location, most Medicare beneficiaries reside in the South Atlantic, East North Central, or Middle Atlantic Census divisions; however, the highest percentage

Table 6

**Demographic Characteristics of Medicare Beneficiaries on the October 2005 Unloaded Medicare Enrollment Database (EDB) Whose Race/Ethnicity Changed as a Result of the Naming Algorithm**

Result	Changed to Hispanic after Naming Algorithm		Changed to Asian after Naming Algorithm		No Race/Ethnicity Change after Naming Algorithm		Total	
	Number <sup>1</sup>	% Distribution	Number <sup>2</sup>	% Distribution	Number <sup>3</sup>	% Distribution	Number	% Distribution
Demographics								
Total Enrollees	22,457,921	100	336,363	100	40,529,8713	100	43,112,026	100
Percent Distribution of Enrollees Who Changed								
Male	1,043,626	46.5	158,149	47	17,785,314	43.9	18,987,089	44
Female	1,202,166	53.5	178,214	53	22,744,553	56.1	24,124,933	56
<b>Age</b>								
Under 65 Years	504,602	22.5	37,533	11.2	6,783,403	16.7	7,325,538	17
65–74 Years	1,147,650	51.1	208,407	62	16,858,581	41.6	18,214,638	42.2
75–84 Years	425,599	19	66,419	19.7	12,260,585	30.3	12,752,603	29.6
85 Years or Over	167,941	7.5	24,004	7.1	4,627,302	11.4	4,819,247	11.2
<b>EDBRACE</b>								
White	1,853,098	82.5	52,955	15.7	34,088,100	84.1	35,994,153	83.5
Black	84,962	3.8	4,848	1.4	4,143,584	10.2	4,233,394	9.8
Hispanic	NA	NA	NA	NA	946,731	2.3	946,731	2.2
Asian/Pacific Islander	36,258	1.6	n/a	n/a	620,150	1.5	656,408	1.5
American Indian/Alaska Native	1,058	0	647	0.2	167,852	0.4	169,557	0.4
Other	252,451	11.2	272,261	80.9	455,328	1.1	980,040	2.3
Unknown/Missing	17,965	0.8	5,652	1.7	108,126	0.3	131,743	0.3
<b>Medicare Plan</b>								
Fee-for-Service	1,719,178	76.6	258,421	76.8	34,948,719	86.2	36,926,318	85.7
Medicare Advantage	526,614	23.4	77,942	23.2	5,581,152	13.8	6,185,708	14.3
<b>Medicaid Status</b>								
Dually Eligible	554,080	24.7	73,945	22	6,074,887	15	6,702,912	15.5
Not Dually Eligible	1,691,712	75.3	262,418	78	34,454,984	85	36,409,114	84.5
<b>County in MSA</b>								
Yes	1,423,465	63.4	301,721	89.7	30,940,423	76.3	32,665,609	75.8
No	748,776	33.3	21,504	6.4	9,209,996	22.7	9,980,276	23.1
Missing	73,551	3.3	13,138	3.9	379,452	0.9	466,141	1.1
<b>Census Division</b>								
New England	49,208	2.2	8,994	2.7	2,162,669	5.3	2,220,871	5.2
Middle Atlantic	229,625	10.2	45,751	13.6	5,949,825	14.7	6,225,201	14.4
East North Central	96,801	4.3	22,610	6.7	6,636,175	16.4	6,755,586	15.7
West North Central	20,919	0.9	6,742	2	3,005,477	7.4	3,033,138	7
South Atlantic	275,051	12.2	31,921	9.5	8,056,200	19.9	8,363,172	19.4
East South Central	8,591	0.4	3,309	1	2,836,825	7	2,848,725	6.6
West South Central	348,819	15.5	15,759	4.7	3,875,965	9.6	4,240,543	9.8
Mountain	180,241	8	13,166	3.9	2,369,098	5.8	2,562,505	5.9
Pacific	501,604	22.3	176,970	52.6	5,206,190	12.8	5,884,764	13.6
Missing	534,933	23.8	11,141	3.3	431,447	1.1	977,521	2.3

<sup>1</sup> 5.2 percent of all enrollees.

<sup>2</sup> 0.8 percent of all enrollees.

<sup>3</sup> 94 percent of all enrollees.

NOTES: EDBRACE is the unadjusted variable from the EDB from October 2005. NEWRACE is the result of the author's tabulations of having run the algorithm on those same beneficiaries from the EDB from October 2005. MSA is metropolitan statistical area. NA is not applicable.

SOURCE: Eicheldinger, C. and Bonito, A., RTI International, 2007.

recoded to Hispanic live in the Pacific (22.3 percent) or West South Central (15.5 percent) divisions. By far, the highest percentage of beneficiaries recoded to Asian/Pacific Islander resides in the Pacific division (52.6 percent).

Tables 7 and 8 illustrate further differences among the beneficiaries recoded to Hispanic and Asian/Pacific Islander, respectively. These tables present differences according to their original race/ethnicity, age, and sex. Overall, more female (1,202,084) than male beneficiaries

(1,043,554) were recoded to Hispanic. This pattern holds true for beneficiaries originally coded as White, Black, and Asian/Pacific Islander. However, as shown in Table 6, there are more female beneficiaries in the EDB, and when sex distributions are compared, males are recoded at a higher percentage than would be expected. The largest number of new Hispanic beneficiaries is in the age group 65 to 74. This is true regardless of the beneficiaries' original EDB race/ethnicity code and sex, with the exception of American Indians/Alaska Natives, where the largest group of new Hispanics was in the under age 65 category. Not surprisingly, the age group 85 or over had the fewest recoded, which reflects the overall age distribution of Medicare beneficiaries.

With respect to sex and age, the Asian/Pacific Islander recodes were similar to the Hispanic recodes. Across original EDB race/ethnicity and age groups, with the exception of the American Indians/Alaska Natives under age 65 and the Other or Unknown groups under age 65, and those 65 to 74, more females were recoded to Asian/Pacific Islander than males. Overall 178,179 females were recoded compared with 158,120 males. As with Hispanic beneficiaries, beneficiaries age 65 to 74 were recoded most to Asian/Pacific Islander. Male and female Asians/Pacific Islanders followed the same overall pattern as male and female Hispanics, with the age group 85 or over having the least recodes, and the age group 65 to 74 having the most. Again, this reflects the overall age distribution of Medicare beneficiaries.

## DISCUSSION

The importance of correctly identifying the race/ethnicity of Medicare beneficiaries when conducting studies of health services utilization cannot be overstated in

a period of sensitivity to reports of health care disparities. Often, results of health care utilization studies are used to justify the development of corrective health policy. These studies often use claims and measure the number and proportion of persons obtaining specific services for particular diagnoses. If the administrative records that are used to identify race/ethnicity systematically under-identify a large proportion of a particular racial/ethnic group, the number of service users identified in that group will be smaller than it actually is. This is exactly the case represented by Hispanics, Asians/Pacific Islanders, and American Indians/Alaska Natives on the Medicare EDB.

To illustrate the difference inaccurately coded race/ethnicity can make, we associated EDB race/ethnicity with participants in the 2000 and 2001 Medicare fee-for-service CAHPS<sup>®</sup> survey who self-reported their race/ethnicity. We determined whether the respondents were diabetic from their prior year's Medicare claims. These are presented by race/ethnicity for SELFRACE, EDBRACE, and the ratio of the two in Table 9. Note that the number of Hispanics, Asians/Pacific Islanders, and American Indians/Alaska Natives with diabetes are considerably underestimated using EDBRACE. We also determined from these claims whether those identified as being diabetic had received each of four recommended diabetes secondary preventive services—foot care, eye exam, testing (Hemoglobin A1c, lipid profile, and micro-albumin), and self-care training and education. We divided the number of diabetic beneficiaries using the services in the previous year according to their self-reported race/ethnicity by the number using them according to their EDB race/ethnicity to create a ratio for each service. We also calculated a mean ratio across the four services.

Table 7

### Distribution of New Hispanic Beneficiaries (NEWRACE) According to Their EDBRACE, Sex, and Age Group

EDBRACE, Sex and Age Group	White			Black			Asian/Pacific Islander			American Indian/Alaska Native			Other or Unknown			Total	
	Number	Percent	Percent	Number	Percent	Percent	Number	Percent	Percent	Number	Percent	Percent	Number	Percent	Percent	Number	Percent
Total	1,853,098	82.5		84,962	3.8		36,258	1.6		1058	0		270,262	12.0		2,245,638 <sup>1</sup>	100
Male	852,914	81.7		39,868	3.8		14,880	1.4		544	0.1		135,348	13.0		1,043,554	100
Under 65 Years	206,880	76.8		12,387	4.6		2,238	0.8		314	0.1		47,590	17.7		269,409	100
65–74 Years	446,264	83.1		19,465	3.6		7,769	1.4		121	0		63,189	11.8		536,808	100
75–84 Years	154,271	85.3		5,691	3.1		4,020	2.2		100	0.1		16,842	9.3		180,924	100
85 Years or Over	45,499	80.7		2,325	4.1		853	1.5		9	0		7,727	13.7		56,413	100
Female	1,000,184	83.2		45,094	3.8		21,378	1.8		514	0		134,914	11.2		1,202,084	100
Under 65 Years	185,013	78.7		10,881	4.6		2,037	0.9		247	0.1		36,983	15.7		235,161	100
65–74 Years	516,090	84.5		21,379	3.5		11,601	1.9		154	0		61,582	10.1		610,806	100
75–84 Years	208,252	85.1		8,092	3.3		6,303	2.6		93	0		21,854	8.9		244,594	100
85 Years or Over	90,829	81.4		4,742	4.3		1,437	1.3		20	0		14,495	13.0		111,523	100

<sup>1</sup> Excludes 154 beneficiaries with EDBRACE equal to missing.

NOTES: EDBRACE is the unadjusted variable from the Medicare enrollment database (EDB) from October 2005. NEWRACE is the result of the author's tabulations of having run the algorithm on those same beneficiaries from the EDB from October 2005.

SOURCE: Eicheldinger, C. and Bonito, A., RTI International, 2007.

Table 8

### Distribution of New Asian/Pacific Islander Beneficiaries (NEWRACE) According to Their EDBRACE, Sex, and Age Group

EDBRACE, Sex and Age Group	White			Black			American Indian/Alaska Native			Other or Unknown			Total	
	Number	Percent	Percent	Number	Percent	Percent	Number	Percent	Percent	Number	Percent	Percent	Number	Percent
Total	52,955	15.7		4,848	1.4		647	0.2		277,849	82.6		336,299 <sup>1</sup>	100.0
Male	17,162	10.9		1,707	1.1		305	0.2		138,946	87.9		158,120	100.0
Under 65 Years	2,995	15.9		534	2.8		66	0.4		15,188	80.9		18,783	100.0
65–74 Years	8,726	8.5		827	0.8		162	0.2		93,520	90.6		103,235	100.0
75–84 Years	4,276	15.4		292	1.1		68	0.2		23,171	83.3		27,807	100.0
85 Years or Over	1,165	14.0		54	0.7		9	0.1		7,067	85.2		8,295	100.0
Female	35,793	20.1		3,141	1.8		342	0.2		138,903	78.0		178,179	100.0
Under 65 Years	5,440	29.0		758	4.0		51	0.3		12,480	66.6		18,729	100.0
65–74 Years	18,915	18.0		1,582	1.5		200	0.2		84,465	80.3		105,162	100.0
75–84 Years	8,615	22.3		612	1.6		79	0.2		29,278	75.9		38,584	100.0
85 Years or Over	2,823	18.0		189	1.2		12	0.1		12,680	80.7		15,704	100.0

<sup>1</sup> Excludes 64 beneficiaries with EDBRACE equal to missing.

NOTES: EDBRACE is the unadjusted variable from the Medicare enrollment database (EDB) from October 2005. NEWRACE is the result of the author's tabulations of having run the algorithm on those same beneficiaries from the EDB from October 2005.

SOURCE: Eicheldinger, C. and Bonito, A., RTI International, 2007.



**Table 9**  
**Number and Percent of Medicare Beneficiaries With Diabetes Diagnosis, by EDBRACE and SELFRACE and Ratio of SELFRACE to EDBRACE**

Race/Ethnicity	EDBRACE		SELRACE		Ratio <sup>1</sup>	
	Number	Percent	Number	Percent	Numbers	Percents
White	30,300	15.3	27,939	15.0	0.92	0.98
Black	3,869	24.6	3,463	24.7	0.90	1.00
Hispanic	835	27.2	2,254	25.5	2.70	0.94
Asian/Pacific Islander	316	15.7	437	15.5	1.38	0.98
American Indian/Alaska Native	103	27.5	263	23.3	2.55	0.85
Other/Unreported	374	17.5	1,441	17.0	3.85	0.97

<sup>1</sup> The number of persons according to SELFRACE/number of persons according to EDBRACE and percent of persons according to SELFRACE/percent of persons according to EDBRACE.

SOURCE: Eicheldinger, C. and Bonito, A., RTI International, 2007.

The mean ratios for White and Black beneficiaries were 0.93 and 0.90, respectively, suggesting that the counts based on their race/ethnicity self-reports were 7 and 10 percent lower than for their EDB race/ethnicity. With ratios less than 1.00, it confirms the findings from our assessment of EDB race/ethnicity for White and Black beneficiaries. On the other hand, the mean ratios for Hispanics (2.53) and Asians/Pacific Islanders (1.34) are greater than 1.00 for those groups, also confirming our earlier assessment of EDB race/ethnicity. This analysis indicates that using the numbers of diabetic Hispanic and Asian/Pacific Islanders classified according to the EDB race variable would certainly undercount them, especially Hispanics, the largest and fastest growing minority group in the Nation.

Knowing that the number of beneficiaries included in a racial/ethnic group is too large or too small certainly places limitations on the use that can be made of the number. But, if the utilization patterns of the persons in those groups identified using administrative data are similar to those of persons who self-identified as being in the same group, then using the proportion of the group who used the services rather than the number may be unbiased and useful for many policy purposes.

We examined the utilization percentages for the same diabetes preventive services using ratios of the percentages (Table 10). The mean ratio across the four diabetes preventive services for White beneficiaries was 1.01, indicating only a 1-percent higher rate of use when self-reported race was used instead of the EDB race. The

**Table 10**  
**Ratios of Number of Medicare Beneficiaries With Diabetes Who Used Selected Diabetic Services, by Race/Ethnicity**

Race/Ethnicity	Foot Care	Eye Exam	Physiological Measures	Self-Care and Education	Mean Ratio <sup>1</sup>
White	0.99	1.01	1.01	1.01	1.01
Black	0.99	1.01	1.00	1.01	1.00
Hispanic	0.84	0.94	1.00	0.97	0.94
Asian/Pacific Islander	0.84	1.01	1.01	1.00	0.97
American Indian/Alaska Native	1.13	1.14	1.34	1.68	1.32
Other/Unreported	1.43	1.13	1.07	1.30	1.23

<sup>1</sup> The proportion of persons according to SELFRACE/proportion of persons according to EDBRACE.

SOURCE: Eicheldinger, C. and Bonito, A., RTI International, 2007.

mean ratio for Black beneficiaries was 1.00, indicating that the average percentage using the four services was the same, regardless of the race measure used. Thus for White and Black beneficiaries, despite their overrepresentation according to the EDB race variable, the percentages using these services are fairly accurate. However, the situation was different for Hispanics and Asians/Pacific Islanders. The mean ratios for Hispanics and Asians/Pacific Islanders were 0.94 and 0.97, respectively. This indicates that classifying beneficiaries according to their EDB race overstates the proportion of Hispanics and Asians/Pacific Islanders receiving diabetes preventive services by 6 and 3 percentage points, respectively.<sup>7</sup>

## LIMITATIONS

While we have demonstrated a sizable improvement in the Medicare EDB racial/ethnic coding with our algorithm, we would be remiss if we did not acknowledge the limits of this work. Our focus in this research was solely on improving the accurate identification of Medicare beneficiaries on the EDB who are Hispanic (regardless of race) and Asian/Pacific Islanders. Validation of the algorithm showed that it is not perfect in identifying every misclassified Hispanic and Asian/Pacific Islander beneficiary, but it does represent an important improvement. We were clearly more successful with Hispanics than with Asians/Pacific Islanders. However, our algorithm did nothing to improve identification of American Indians/Alaska Natives, thus this group remains underrepresented on the EDB. We feel that analyses of Medicare claims that seek to identify or monitor differences in racial/ethnic disparities in health services utilization can justifiably

be extended to include comparisons of Hispanic and Asian/Pacific Islander along with Black and White beneficiaries. However, we suggest continued restraint and caution be exercised in comparisons involving American Indians/Alaska Natives due to their relatively small numbers and incomplete representation in the EDB coding.

It is also limiting that the imputation process for the race/ethnicity variable on the EDB must be redone or updated every 6 to 12 months to make that variable current for beneficiaries new to the Medicare Program. Every 6 months, approximately 2 million new beneficiaries are added to the Medicare Program, and our update of the NEWRACE variable for mid-2006 indicates that more than 400,000 of them are either Hispanics or Asians/Pacific Islanders. Thus to keep the variable current, updating with the algorithm is essential.

## CONCLUSIONS

We used readily available data to address a longstanding limitation of Medicare coding of beneficiary race/ethnicity. The race/ethnicity codes on the EDB were populated with the SSA codes, and prior to 1980 these codes were limited to White, Black, and Other. Hispanics, Asians/Pacific Islanders, and American Indians/Alaska Natives were all incorrectly lumped together as Other or coded as White or Black. The effect of this has been to limit most analyses of racial/ethnic differences among Medicare beneficiaries to comparisons between White and Black persons. Despite repeated efforts by CMS to correct the race/ethnicity codes dating back to 1994, we found their sensitivities wanting. We developed and tested an algorithm largely using surname lists accumulated by the U.S. Census Bureau that allowed us to more correctly impute race/ethnicity codes for Medicare beneficiaries of Hispanic and

<sup>7</sup> Bonito et al. (2005) present more of these types of comparison of the impacts on services utilization.

Asian/Pacific Islander origin. The algorithm increased the number of identified Hispanics by more than three times, and the number of Asians/Pacific Islanders by almost one-third, producing significantly higher sensitivities.

## Implications

The primary implication of having developed a scientifically sound method to more accurately assign Medicare beneficiary's race/ethnicity codes for Hispanic and Asian/Pacific Islander is to greatly enlarge the potential analytic and policy uses of Medicare administrative data, especially with regard to issues of health care disparities and equity. It is particularly important to be able to discuss disparities beyond those experienced by Black beneficiaries alone, especially since Hispanics now are the largest and fastest growing minority group in the U.S. It means that it is possible to validly and reliably report health services utilization according to race/ethnicity for more than White and Black beneficiaries. It means that efforts to identify health care disparities between Medicare beneficiaries who are White, Black, Hispanic, or Asian/Pacific Islander can safely proceed. Finally, it means it is possible to monitor efforts being made to reduce or eliminate health care disparities among these groups.

In addition to contributing to research and policy on eliminating health care disparities, having more accurate race/ethnicity data makes it possible for CMS to monitor the participation in new and existing Medicare Program options (e.g., Medicare Part D or Medicare Advantage plans) by racial/ethnic groups. It also allows CMS to target information and enrollment efforts to minority group beneficiaries about programs for which they

may be eligible, but in which they do not appear to be participating adequately.

## ACKNOWLEDGMENTS

We gratefully acknowledge Linda Greenberg for her direction and assistance in the successful completion of the research project from which this article was derived and Lisa Carpenter for her statistical programming.

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